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CASE REPORT

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Endovascular treatment of an Aneurysm of the Thoracic Aorta arising after an operation for Coarctation of the Aorta

Endowaskularne leczenie tętniaka aorty piersiowej powstałego po operacji koarktacji aorty.

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SUMMARY

Background: Aneurysms of the thoracic segment of the descending aorta occur relatively infrequently but do, however, directly endanger the life of the patient due to the danger of rupture. The study pays particular attention to the incidence of iatrogenic aneurysms after surgical treatment for coarctation of the aorta and the possibility of treatment using endovascular methods.

Case Report: The case is described of a patient in whom, 19 years after operation for coarctation of the aorta, an aneurysm of the descending part of the thoracic aorta was diagnosed.

Conclusions: The aneurysm was treated endovascularly by means of a stentgraft.

Key words: thoracic aneurysm • endovascular treatment • stentgraft • coarctation

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INTRODUCTION

Aneurysms of the thoracic part of the descending aorta occur relatively infrequently but do, however, represent a direct danger to the life of the patient. The most frequent cause of death of patients with an untreated aneurysm of the thoracic aorta is rupture of the aneurysm. This study draws attention to the incidence of iatrogenic aneurysms after surgical treatment for coarctation of the aorta and the possibility of treatment using endovascular methods.

CASE REPORT

A 34-year-old male patient was admitted to the Clinic for Hypertension, Vascular Diseases, and Internal Medicine for treatment of an aneurysm of the thoracic segment of the descending aorta. The aneurysm was diagnosed in 2003 during a periodic examination in a thoracic radiograph. Computerized tomography showed a normal width in the ascending part and the arch of aorta with its outgoing branches. In the descending part, 2 cm below the branching

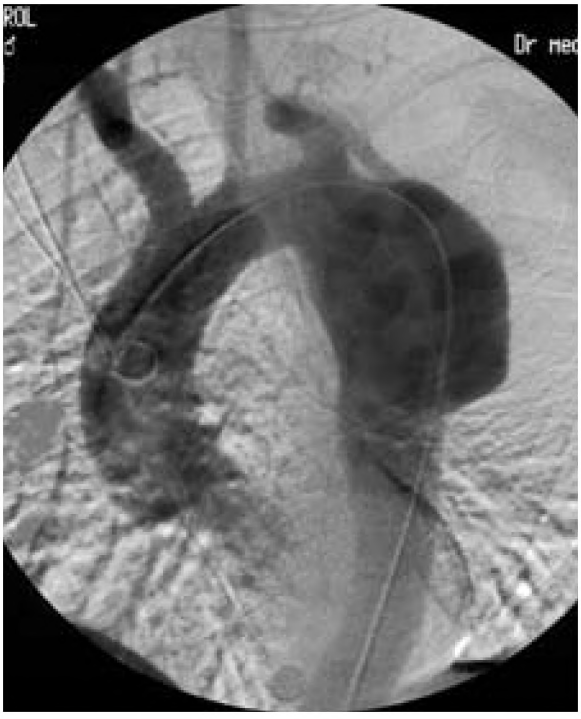

Figure 1. DSA before operation. The true aneurysm of the descending thoracic aorta with 58 mm diameter and a length of 70 mm.
Rycina 1. DSA przed zabiegiem. Tętniak prawdziwy części zstępującej aorty piersiowej o średnicy 58mm i długości 70 mm.

Figure 2. Angiographic control after stentgraft implantation.
Rycina 2. Kontrola angiograficzna po implantacji stentgraftu.

of the left subclavian artery, a true aneurysm of 58 mm diameter and a length of 70 mm was found. In his medical history the patient reported the first diagnosis of aortal hypertension as being made in childhood and a diagnosis of type 2 coarctation of the aorta as being diagnosed in 1984. In that year an operation was carried out on the narrowed part of the aortic isthmus using a patch made of synthetic material (modo Vosschulte). The procedure was without complications.

On admission the patient did not complain of any subjective symptoms from the existing aneurysm. Examination, however, revealed an arterial pressure of 140/100. The operation was carried out at the Vascular Laboratory, Department of Clinical Radiology, with epidural anesthesia. After puncturing the left common femoral artery (method of Seldinger), a pigtail 5F catheter (Balt) was introduced as far as the entrance to the aorta. After surgical exposure of the right common femoral artery and transverse arteriotomy, a stentgraft Zenith (Cook) of 22 F diameter was introduced on a guidewire, type Amplatz 0.35 (Cook). The diameter of the stentgraft used was 32 mm and the length was 140 mm. Before introduction of the prosthesis, 5000 U of heparin was given intravenously. After accurate location of the prosthesis, the patient's arterial pressure lowered to a level of 90/60. Next, the tension of the stentgraft was released and its proximal part was adapted to fit with the help of a latex balloon (Cook). The procedure was carried out without complications. Angiographic control via the retained pigtail catheter indicated a free flow of blood through the prosthesis without fear of leakage into the lumen of the aneurysm. In addition, CT examination after the procedure confirmed the effective isolation of the aneurysm from the circulation. The patient was discharged after four days, in a generally healthy state.

DISCUSSION

Aneurysms occurring in the region of the aorta most commonly affect the abdominal part, below the renal arteries, and only a dozen or so of them are aneurysms of the ascending part, aortic arch, and descending part in the thoracic region. Aortal aneurysms as complications of the operative procedure for coarctation of the aorta occur, however, with a frequency described in various centers as being from 5–46%[1]. An alternative method to surgical operation for coarctation of the aorta is balloon angioplasty. However, in the case of this technique there is also a significant risk of aneurysm arising, estimated in the existing literature at about 20% [2].

There are a number of hypotheses that explain the causes of postoperative aneurysm after procedures for coarctation of the aorta. According to Clark et al. [3], these aneurysms result from a weakened union between the end of the vessel and the prosthesis. Wray et al. [4] came to different conclusions. They suggest that the cause of the aneurysm is a significant thickening of the aortal wall at the site of the operation previously carried out, with associated changes of a degenerative character in the region of the middle layer of the vascular wall which have not

Figure 3. CT examination before operation.
Rycina 3. Badanie KT przed zabiegiem.

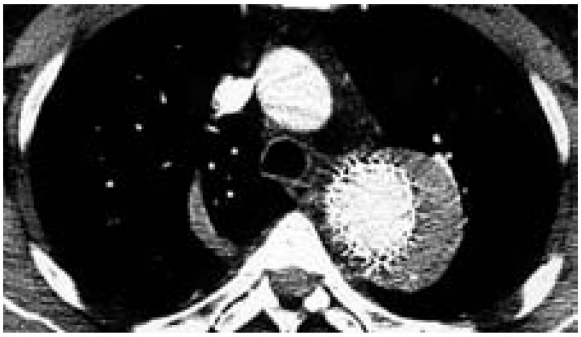

Figure 4. CT examination after the procedure confirmed the effective isolation of the aneurysm from the circulation.
Rycina 4. Badanie KT po zabiegu potwierdziło zupełne wyłączenie tętniaka z krążenia.

arisen in the remainder of the vessel. These changes are similarly explained by Hehrelin et al. [5], who diagnosed degenerative changes in the middle layer of the wall of the aneurysm in more than half of a large group of 317 patients.

Due to the relatively frequent incidence of aneurysm as a complication of the operation, many patients have had to undergo a further cardiovascular procedure with the aim of avoiding rupture of the aneurismal wall and have had to suffer all the possible symptoms. Note-worthy is also the fact that the aneurysm is a late complication after an operation for coarctation of the aorta. Data from the University Hospital in Helsinki [6] can be given as an example. Here, aneurysms occurred in about 33% of cases as a postoperative complication, and reoperation was performed on average 12.3 years after the initial procedure. Roth et al. [7] gave similar results, calculating the period for postoperative aneurysm to arise as being from 6 to 18 years. This is a period of time that is long enough for many patients to neglect regular cardiological control visits which, in connection with the frequent absence of symptoms from the aneurysm itself, may lead to its development and possible rupture.

An interesting study was presented by Al-Hroob et al. [8] from The Children's Institute of Cardiology. They evaluated the results of computerized tomography of the aorta in 19 patients over a period of from 3 months to 17.5 years after aortoplasty using a synthetic patch. The aim of that study was to determine whether a visible widening of the lumen of the vessel is a true aneurysm. On the basis of the measurements carried out, they concluded that in none of the cases examined was the visible widening of the lumen a true aneurysm, but that it was caused by the dimensions of the sutured patch and partly by the enhanced growth of the vessel wall. It must, however, be remembered that these data refer to pediatric patients, and the causes given for the widening of the aortal wall may not be reflected in the case of adult patients.

In spite of the significant progress that has taken place in surgery of aneurysms of the thoracic aorta in recent years, these procedures are still burdened with high mortality. In operations on the descending aorta, this is at a level of 14.3% [9]. In the studies of Lawrie [10] based on an analysis of 659 procedures carried out on the descending aorta, the principal cause of death, i.e. 48%, was cardiac infarct. At the same time, in the group of patients who survived the operation, more than half had ischemic changes on the ECG. Endovascular treatment of aneurysms of the descending aorta is an incomparably less invasive procedure, which means fewer postoperative complications. This is, therefore, a valuable alternative to surgery, especially in individuals with coexisting conditions and with increased operation risk. This method has been found useful in the treatment of aortal aneurysms over a relatively short period. The first reports about stentgraft implants in aneurysms of the descending aorta are from 1991 [11]. However, in 1994 Dake et al. [12], as one of the first, presented a study describing 13 cases of intravascular implantation of stentgraft in aneurysms of the descending aorta in the thoracic part. On the basis of the literature from the last 10 years, it is estimated that endovascular treatment of aneurysms of the descending aorta carries a mortality risk of 2.4–6.2% [9].

Aneurysms of the descending aorta as a consequence of the procedure for coarctation of the aorta create a dangerous complication that endangers the patient's life. The intravascular procedure of implanting a stentgraft together with the effectiveness and the significantly less invasive procedure with a lower risk of complications appears to be the treatment of choice for many patients, especially in cases where they are burdened with additional risk of operation.

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